1. Chapter
    1. Astronomy test
    2. Another Module

Astronomy test

LEARNING OBJECTIVES

- Define matter and elements
- Describe the interrelationship between protons, neutrons, and electrons
- Compare the ways in which electrons can be donated or shared between atoms
- Explain the ways in which naturally occurring elements combine to create molecules, cells, tissues, organ systems, and organisms

Thermal energy (Measurement of Heat) associated with the random motion of atoms and molecules. The greater the amount of thermal energy in a sample of matter, the more vigorous the motion of its atoms and molecules. If we increase the amount of thermal energy in a sample of matter, either the temperature of the substance increases, or the substance melts or evaporates with no change in temperature. If we decrease the amount of thermal energy, either the temperature of the substance decreases, or the substance condenses or freezes with no change in temperature. We can detect a change in the amount of thermal energy in a substance by observing a temperature change or a phase change (melting, freezing, evaporation, and so on).

Note:
Astronomy Basics

Carbon Neutrons

An atom is so small that its size is difficult to imagine. One of the smallest things we can see with our unaided eye is a single thread of a spider web: these threads are about 0.0001 centimeter (1/25,000 inch) in diameter. The carbon atoms in a spider web are much smaller, with a diameter of about 0.000000015 centimeter. It would take about 7000 carbon atoms to make a line the same length as the diameter of a single thread of a spider web. If we take a pair of scissors and cut one such thread into two pieces, the flat end of each piece would be so small that most of us would have trouble seeing the thread “end on”. If each carbon atom in a cut thread suddenly expanded to the size of a dime, the flat end of a cut thread would expand so the end was a little larger than a football field. Imagine the number of dimes it would take to cover a football field. It takes that many atoms to cover the cut end of the thread of a spider web.

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Heat is energy that is transferred between two bodies that are at different temperatures. Transfer of heat increases the thermal energy of one body and decreases the thermal energy of the other. Heat will move spontaneously from a warmer substance to a colder substance until the temperatures of the two substances are equal. Chemical reactions and physical changes can release or absorb heat. A change that releases heat is called an exothermic process. The burning of charcoal, for example, is an exothermic process. A reaction or change that absorbs heat is an endothermic process. The boiling of water is an endothermic process, because heat is absorbed when water boils.

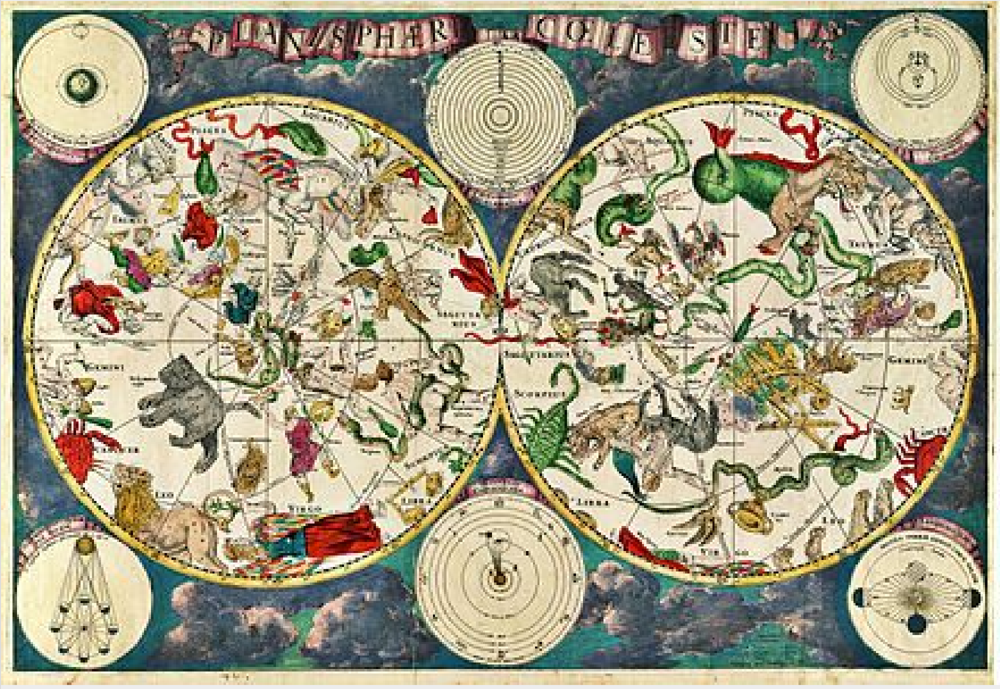
In the absence of a phase change, we can increase the temperature of an object by adding heat, or some other form of energy, to it [link]. Removing heat, or some other form of energy, reduces the temperature. For example, when hot coffee is poured into a mug, the coffee becomes cooler and the mug warmer as heat moves from the hot coffee into the cooler mug [link].

Example:

Nesting Testing Example

This Example is for nesting testing. There are figures, images, and tables in it. There are also index term tags: **astronomy**.

Astronomy is Old



People have been making star maps for EVER.

There are also photographs of stars and stuff.

(1,1)	(1,2)	(1,3)
(2,1)	(2,2)	(2,3)

(3,1)	(3,2)	(3,3)

It has a caption.

Some inline mathML: $q_{\text{reaction}} + q_{\text{solution}} = 0$
Some display mathML:
Equation:

$$q_{\text{reaction}} + q_{\text{solution}} = 0$$

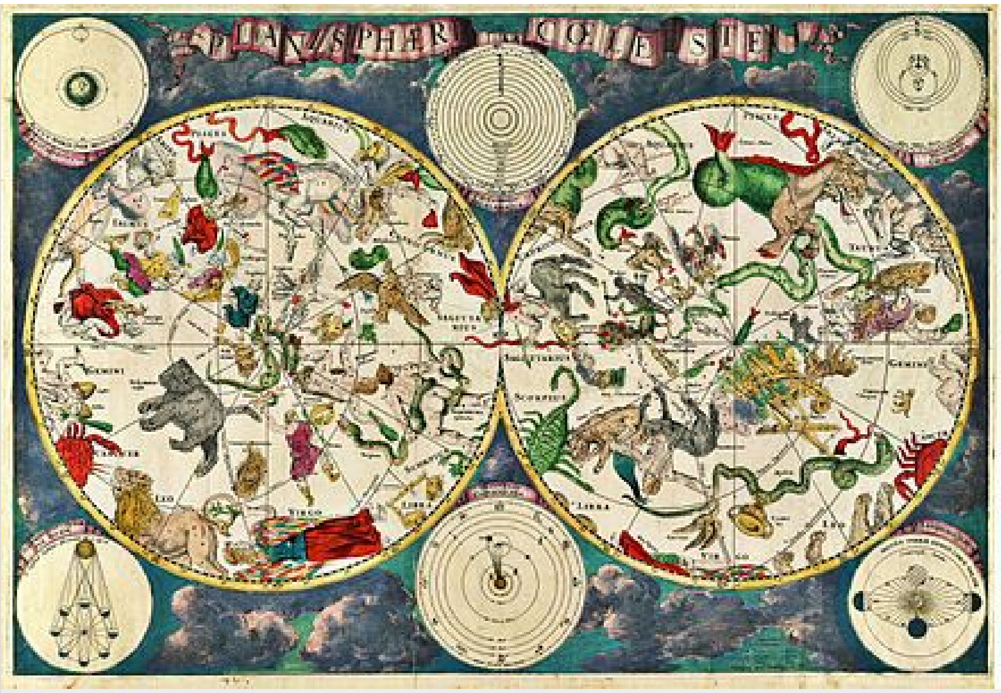
Here is a footnote.[footnote] Here is a non-shortlinked external URL. Here is a link to a figure: [link]. Here is a link to another feature: [link]. And a link to another Example in another module: [link].
Footnotes should work in examples.

- Here is a list with bullets.
- etc.

1. Here is a list with numbers.
2. etc.

a. Here is a list with letters.
b. etc.

Solution
This is the solution.
Check Your Learning
Astronomy is Still Old in Check Your Learning



This figure is inside Check Your Learning.

This image is in a Check Your learning.

(1,1)	(1,2)	(1,3)
(2,1)	(2,2)	(2,3)

(3,1)	(3,2)	(3,3)

Check Your Learning TableIt has a caption.

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- Here is a list with bullets.
- etc.

1. Here is a list with numbers.
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a. Here is a list with letters.
b. etc.

Note: Answer
this is the answer

Summary

The core threats to biodiversity are human population growth and unsustainable resource use. To date, the most significant causes of extinctions are habitat loss, introduction of exotic species, and overharvesting. Climate change is predicted to be a significant cause of extinctions in the coming century.

Habitat loss occurs through deforestation, damming of rivers, and other activities. Habitat loss occurs through deforestation, damming of rivers, and other activities other activities. Habitat loss occurs through deforestation, damming of rivers, and other activities other activities.

For Further Exploration

Scharf, C. The Copernicus Complex: Our Cosmic Significance in a Universe of Planets and Probabilities, 2014, Scientific American / Farrar, Straus and Giroux. Fascinating book that explores the history of the Copernican Revolution and the implications of Copernican philosophy for present-day Astronomy.

Staal, J. The New Patterns in the Sky: Myths and Legends of the Stars, 1988, Mcdonald & Woodward Publishing Co. A comprehensive guide to the mythology of the 88 constellations in our sky.

Collaborative Group Activities

Classify each of the following homogeneous materials as an element or a compound:

A. copper
B. water
C. nitrogen
D. sulfur
E. sucrose
F. a substance composed of molecules each of which contains two iodine atoms

Review Questions

Exercise:

Problem:

Classify each of the following homogeneous materials as an element or a compound:

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Solution:

A. elemental
B. homogeneous
C. elemental
D. elemental
E. homogeneous
F. heterogenous

Thought Questions

Exercise:

Problem:

Why do we use an object’s mass, rather than its weight, to indicate the amount of matter it contains?

Figuring for Yourself

Exercise:

Problem:

Explain the difference between heat ________ and specific heat of a substance.

Solution:

transfer

Glossary

Thermal energy	$\frac{1}{2}x$ example of definition with MathML
heat	energy that is transferred between two bodies that are at different temperatures.
exothermic process	Example of definition with superscripts^{235}
endothermic process	This definition has subscripts$_2$O
Thermal energy	This definition has special characters åß¬˚ß∂ª£¶∞π, punctuation ()..,"~;

Another Module

LEARNING OBJECTIVES

- Define matter and elements
- Describe the interrelationship between protons, neutrons, and electrons
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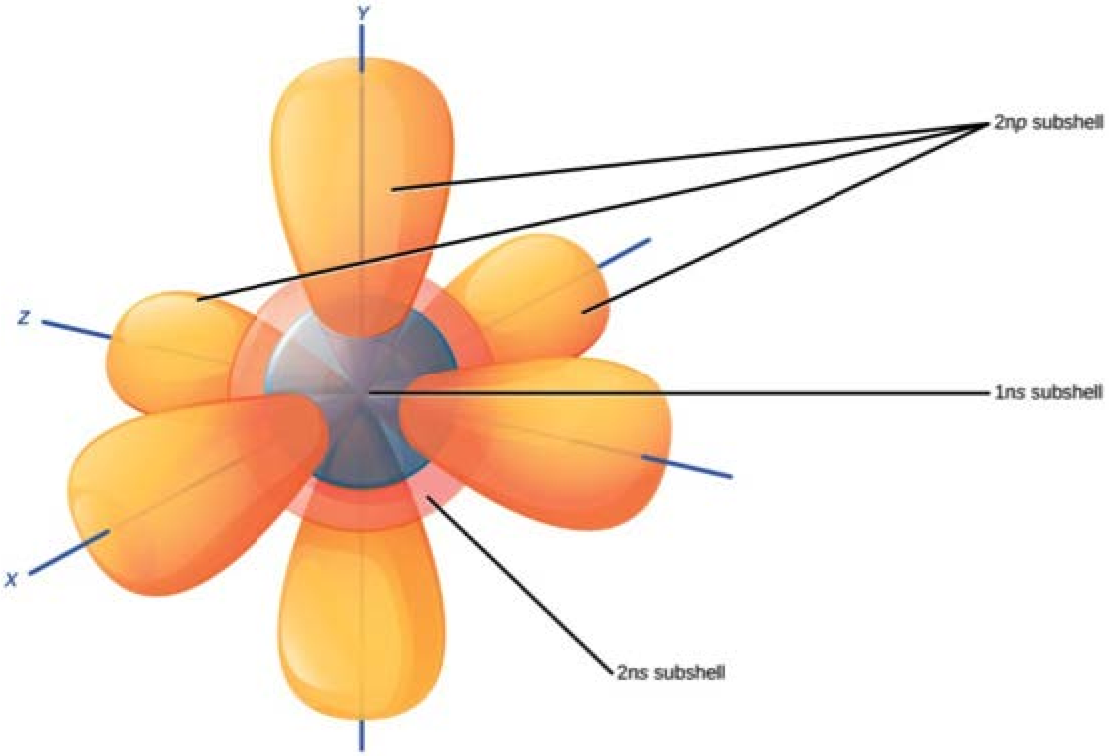
One technique we can use to measure the amount of heat involved in a chemical or physical change is called **calorimetry**. The simplest form of calorimetry is based on measuring the temperature change as heat is transferred into or out of a known quantity of water.

A **calorimeter** is a device used to measure the amount of heat involved in a chemical change. General chemistry students often use calorimeters constructed from two polystyrene cups like those used for coffee or other hot beverages [link]. Because the cups are good insulators, they prevent the loss (or gain) of heat to (or from) the surroundings. When an exothermic reaction occurs in solution in such a calorimeter, the heat produced by the reaction is trapped in the solution and increases its temperature. When an endothermic reaction occurs, the heat required is absorbed from the thermal energy of the solution and decreases its temperature. The change in temperature can be used to calculate the amount of heat involved in either case.

Endothermic Charge



An endothermic change converts the color form orange to yellow when the paper is warmed.

When we use polystyrene cups as a calorimeter, the amount of heat absorbed by the calorimeter is usually small enough that we can neglect it, and the amount of heat produced in the reaction, q_{reaction}, equals the amount of heat absorbed by the solution, q_{solution}. Because energy can be neither created nor destroyed in a chemical reaction,

Equation:

$$q_{\text{reaction}} + q_{\text{solution}} = 0$$

and

Equation:

$$q_{\text{reaction}} = -q_{\text{solution}}$$

confirming this scientific principle.

If the amount of heat absorbed by a calorimeter is too large to neglect or if we want more accurate results, then we must take into account the heat absorbed both by the solution and by the calorimeter.

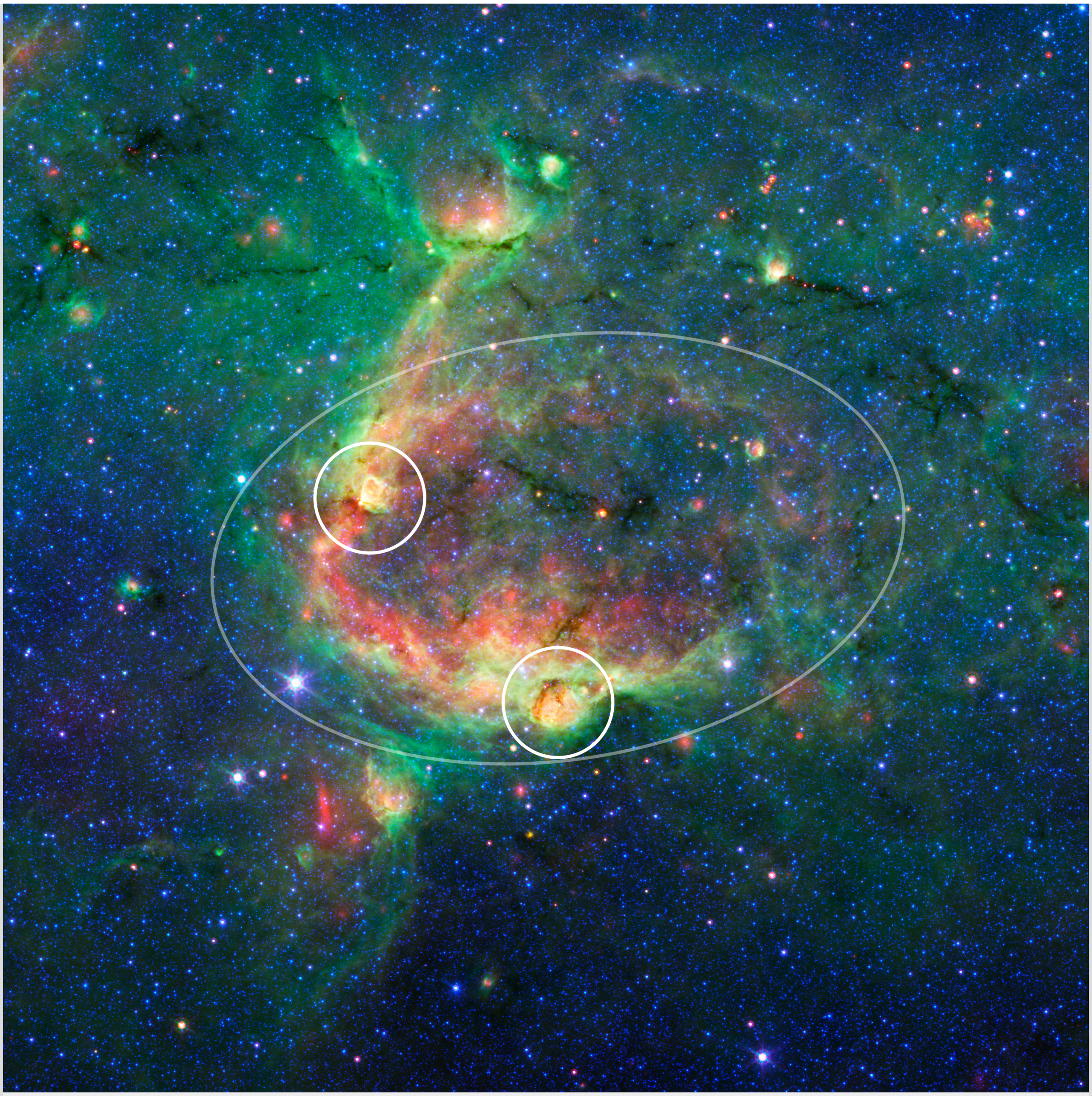
Not all calorimeters trap the heat of a reaction in a solution of the products. If a reaction were run in the steel container of the calorimeter shown in [link], the heat of the reaction would be trapped in the container and in the water surrounding the container. Such calorimeters are used to measure the heats of reactions involving gases. A modification of such a calorimeter was used to measure the heat produced by a living person. A man lived for four days inside a small room surrounded by water.

This Section is for Nesting Testing

Note:
Astronomy Basics
There are figures, images, and tables in this note. There are also index term tags: **astronomy**.
A Note Figure

It has a caption.

Here is an image with no figure tag.



(1,1)	(1,2)	(1,3)
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Note TableIt has a caption.

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Here is a footnote.[footnote] Here is a non-shortlinked URL.
Footnotes should work in appendices.
Wikipedia has this to say about gamma-ray bursts: "Gamma-ray bursts are very bright as observed from Earth despite their typically immense distances. An average long GRB has a bolometric flux comparable to a bright star of our galaxy despite a distance of billions of light years (compared to a few tens of light years for most visible stars). Most of this energy is released in gamma rays, although some GRBs have extremely luminous optical counterparts as well. GRB 080319B, for example, was accompanied by an optical counterpart that peaked at a visible magnitude of 5.8,[65] comparable to that of the dimmest naked-eye stars despite the burst's distance of 7.5 billion light years. This combination of brightness and distance implies an extremely energetic source. Assuming the gamma-ray explosion to be spherical, the energy output of GRB 080319B would be within a factor of two of the rest-mass energy of the Sun (the energy which would be released were the Sun to be converted entirely into radiation)."

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For Further Exploration

Aveni, A. Foundations of New World Cultural Astronomy: A Reader with Commentary, 2008, University Press of Colorado. An insightful collection of readings from a well-known expert on Archaeoastronomy in North, Central and South America.

Collaborative Group Activities

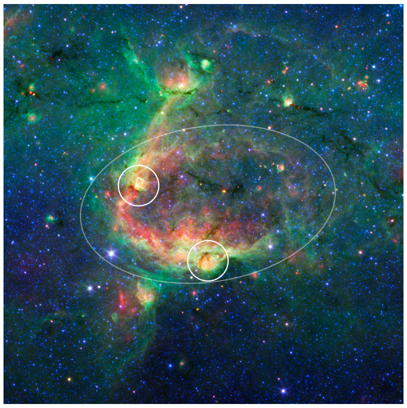
Classify each of the following homogeneous materials as an element or a compound:

A. copper
B. water
C. nitrogen
D. sulfur
E. sucrose
F. a substance composed of molecules each of which contains two iodine atoms

This one has a picture:

A. copper
B. water
C. nitrogen

D.



E. sucrose
F. a substance composed of molecules each of which contains two iodine atoms

Review Questions

Exercise:

Problem:

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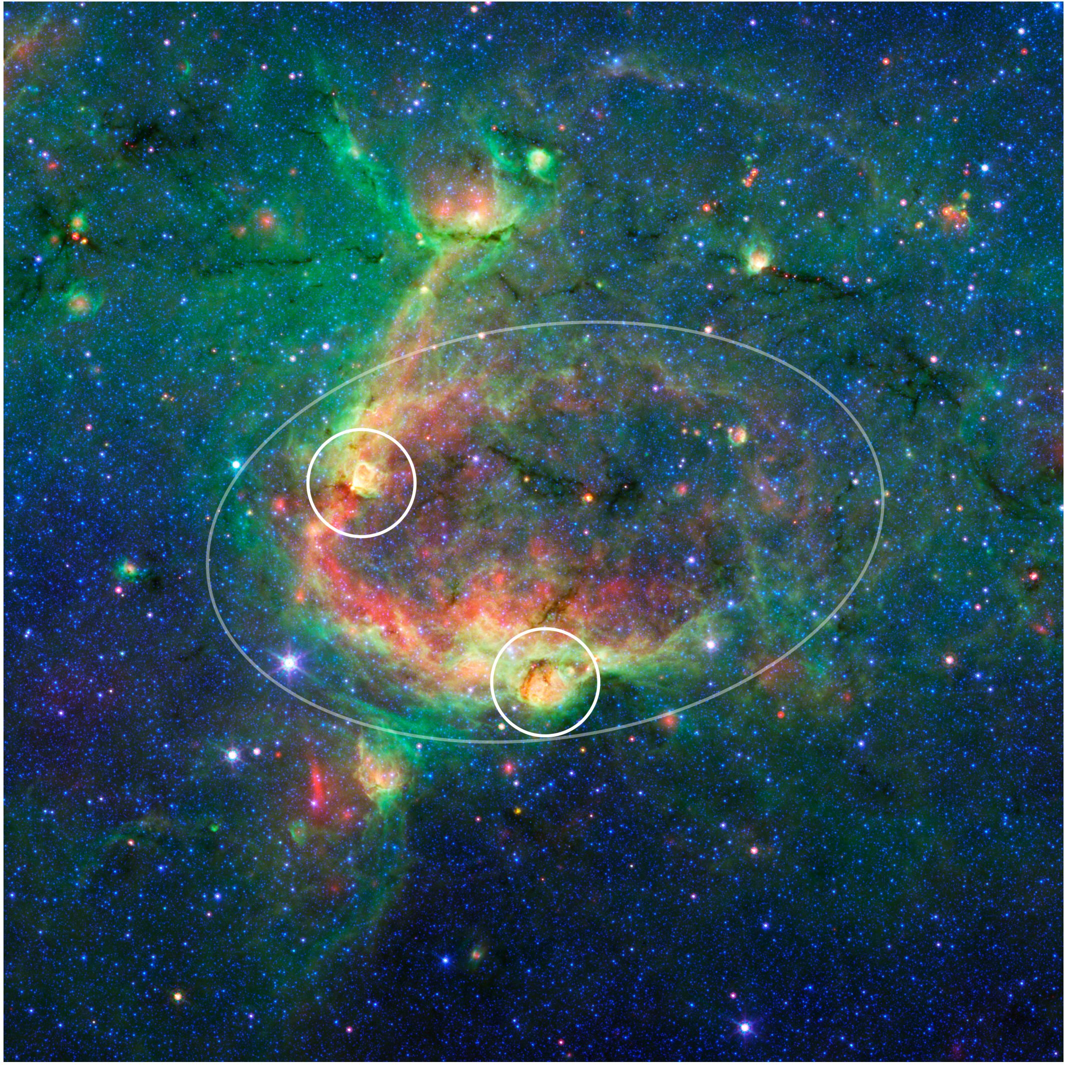
Solution:

F

Exercise:

Problem: This list has a figure in it:

A. copper
B. water
C. nitrogen
D. 
E. sucrose
F. a substance composed of molecules each of which contains two iodine atom

---

Solution:

F

Thought Questions

Exercise:

Problem:

Why do we use an object’s mass, rather than its weight, to indicate the amount of matter it contains?

Exercise:

Problem: This exercise has a table in it.

(1,1)	(1,2)	(1,3)
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(3,1)	(3,2)	(3,3)

Figuring for Yourself

Exercise:

Problem:

Explain the difference between heat ________ and specific heat of a substance.

Solution:

transfer

Exercise:

Problem: This problem has MathML in it. $q_{\text{reaction}} + q_{\text{solution}} = 0$

Solution:

This solution has MathML in it. $q_{\text{reaction}} + q_{\text{solution}} = 0$